Contracting, Competition and Rent Distribution in Commodity Value Chains

Johan F.M. Swinnen and Anneleen Vandeplas[101]

INTRODUCTION

Vertical coordination in agrifood supply chains, often induced by foreign investment, plays an important role in overcoming market imperfections. In many developing and transition countries, farmers have difficulties accessing technology, inputs, credit to produce the commodities which processors and traders want to purchase. As a result, in many of these countries, processing, trading and input supplying companies have engaged in a variety of, sometimes quite unconventional, forms of contracting with farms (Swinnen, 2006). In many cases, processors introduced programs to improve farms' access to inputs. For example, in Kenya, contract farming is widely practised, as input finance is crucial for the production of many high value and export crops (Ruotsi, 2003). The same is found in other African countries, e.g. in the cotton sector (Poulton *et al*., 2004). In the Philippines, Hendriks (1994) notes that wholesale traders provide credit to farmers for fertilizers, pesticides and seeds in order to secure supply. According to Shepherd (2004), supplier assistance programs are a feature of most agricultural marketing systems in Asia, in order to secure supply, guarantee markets and reduce transaction costs.

Effectively, what these companies do is a form of what is described in the development economics literature as "interlinking markets" (see e.g. Bardhan and Udry, 1999). A typical example of this traditional literature is a landlord in a developing country who uses his/her better access to credit to act as an intermediary between an outside loan market and his/her tenants, in addition to their "normal" interaction in the land market. Enforcement of the loans is possible because of the landlord's dominant market position in the land relationship. Another example of this model is the trader-farmer relationship in distant villages. Here, the farmer is dependent on the trader for access to the output markets, while the trader acts as a financial intermediary, allowing the farmer better access to credit. Here, enforcement of the credit transaction (loan and repayment) occurs through the output market.

Similar interlinking is occurring in high-value commodity chains in many developing and transition countries where processors and retailers offer interlinked contracts to local producers. Interlinking markets can bring farm investment and production closer to optimal levels by circumventing imperfections in credit, input, and output markets. In fact, there is substantial empirical evidence that these contracts are having important positive effects on efficiency, productivity and investment (e.g. Dries and Swinnen, 2004).

However, in trying to understand the microfoundations of these new institutions, we should not be blind for their potentially adverse consequences. For example, the very nature of rationale for the emergence of these interlinked transactions may at the same time act as an important barrier to entry for other agents and may give the dominant partner in a transaction some additional leverage. As Bardhan and Udry (1999: 111) remark, "the thin line between *understanding* an institution and *justifying* it is often blurred, particular by careless interpreters of the theory."

The objective of this paper is (a) to analyze the equity and efficiency effects of interlinking in high-value supply chains, and (b) to investigate what the impact of competition is on these effects. Section 2 of the paper presents a conceptual model of interlinking and competition, in order to identify the effects on equity and efficiency. Section 3 reviews some empirical evidence available, including our study of the Central Asian cotton supply chains. Section 4 suggests some observed institutional arrangements that can mitigate potential perverse effects of competition. The final section concludes.

[101] LICOS, Centre for Transition Economics & Department of Economics, K.U.Leuven

THEORY

A Conceptual Framework of Efficiency and Equity with Interlinking

To understand the relationship between equity and efficiency with interlinking markets, consider a contract between a supplying farm (F), with welfare represented by expected utility U^F, and a processing company (C), with expected utility U^C. Figure 1 illustrates the pre- and post-contracting welfare of the agents. Without interlinked contracts the utility possibility frontier is U_0U_0. Assume that actual pre-contract utility is at (U^F_0, U^C_0), represented by point A.

By introducing an interlinked contract, farms can access credit, inputs, etc. which were unavailable before and companies can have access to higher quality and timely supplies. Total welfare increases and the utility possibility frontier shifts to U_1U_1. The question is who benefits from the welfare increase: both agents or only one? In other words, will the new equilibrium be at point W, B, or E? At point E, both parties share in the gains from the institutional innovation, and everybody is better off. At point B, the processing firm extracts all the rents of the innovation. The answer critically depends on each party's bargaining power within the contract.

There are several models in the development economics literature explaining how one can arrive at point B. For example if company C has monopsony powers and can thus set the conditions of the contract, supplier F will accept the contract as long as it is as least as good as his outside option. Hence, at the margin, it will be optimal for C to offer F a contract with conditions which provide F with an expected utility equal to U^F_0, F's reservation utility or outside option. This is the case represented by point B. In output-credit market interlinkages (trader-farmer) C typically does this by subsidizing credits (lower interest rates) and taxing outputs (lower output prices) (Bardhan and Udry, 1999).

If F's bargaining power increases relative to C's, the relationship surplus may be shared more equally, like in E. Genicot and Ray (2006) indicate that in contractual relationships two notions of power can be distinguished: the first is determined by the outside options, the second one occurs in markets with frictions and involves a bilateral notion of power. Although we also take outside options into account, it is this second notion of power that we define as "bargaining power" in our model and which is denoted as β. This is clarified in Figure 2.

In a Nash bargaining framework, utility will be distributed among the bargaining agents so as to maximize collective utility, subject to the prevailing participation constraints of both agents. The participation constraints are given by the agents' respective outside options: in our case, the utility obtained by each in locus A. Every locus on and at the left of the vertical line through A yields F at least his utility in A. In B, his participation constraint is binding. Every locus on and above the horizontal through A yields C at least its utility in A. In D, its participation constraint is binding.

The combined preferences of C and F are represented by the collective indifference curves. The weights of the utility of both agents in these collective preferences are determined by their bargaining power. Figure 2 shows that for preferences represented by the indifference curve I_1I_1 (and parallels), more weight is given to C's utility than for those reflected by I_2I_2. This reflects that C's bargaining power is higher in case of collective preferences I_1I_1 than in case of collective preferences I_2I_2. Preferences represented by I_2I_2 result in a more equal utility distribution. Hence, the equilibrium position between B and D along the frontier is determined by the relative bargaining power.

So far we have argued that the farmer can never be worse off with the contract. However, Bell (1988) shows how in a Nash bargaining framework a peasant may be worse off in dealing with a landlord with interlinked transactions than with separate bilateral bargains because the interlinking of transactions may actually bestow additional monopoly power upon C. Personalized and interlinked transactions can weaken the collective bargaining strengths of workers vis-à-vis employers (Bardhan, 1989). In these cases, one may end up at point W, where F's utility is actually lower after the contract innovations, despite the fact that total welfare has improved significantly.

Hence, an important – and very much an outstanding – issue is how to obtain the efficiency gains without negative equity effects from these institutional innovations, and what role competition plays in this framework.

Available empirical evidence indicates that in many developing and transition countries, positive equity effects seem to have occurred in many cases (Swinnen, 2006; World Bank, 2005). In transition countries, the collapse of farm output and livestock numbers created a gap between processing capacity and supply, and an excess demand based on processing capacity, especially for high quality. This makes it a "suppliers' market" in most of Eastern Europe and Central Asia and this supports the farms' bargaining position in the supply chain. Similarly, in many developing countries there is a shortage of quality supplies for processing and retail companies in high value chains (e.g. Codron *et al*., 2004).

It is important to note that in this paper, we do not to analyze which types of suppliers are participating in interlinked contracts. There is an extensive debate on the likelihood of exclusion of small farmers in this process. This issue is addressed in another paper (see e.g. the paper by Maertens and Swinnen in this volume). The analysis in this paper focuses only on how the surplus that is created through interlinking is divided among the processors (traders, retailers, …) on the one hand and the farms (suppliers) on the other hand, and how competition affects this.

The Role of Competition

Intuitively, one would expect that competition on the demand side among processors and retailers plays an important role in the rent distribution. However, competition will not only affect the rent distribution (equity impact) but also the total amount of rents (efficiency). This is illustrated in Figure 3. First, competition can have a positive equity effect by ensuring suppliers a larger share of the gains from an interlinked contract, as it prevents companies from exercising monopoly power in the setting of the contract conditions. As a result, one ends up somewhere to the right of B, say at point E.

Second, competition can have a positive efficiency effect by inducing buyers to compete not only on prices, but also on services. As a result, if one processor decides to introduce a supplier assistance program, this may induce (or force) other processors to do the same. This may lead to a further spread of assistance programs among competing processors, inducing a shift from U_1U_1 to U_2U_2 and hence from E to H.

Third, competition could also induce opportunistic behaviour of suppliers. A supplier may use the delivered inputs for other crops, not under contract, or sell them to another farmer. As a result, his output will not comply with the agreed quality norms, and the supplier will have to sell his output to another processor at the low-value market. Alternatively, the supplier could apply the delivered inputs according to the contracted processor's indications but sell his output afterwards at a higher price to a competing processor. The competing processor may be able to offer a higher price since the contracting processor takes into account the cost of the delivered inputs in determining the producer's price. If the supplier "side-sells" in this way, interlinking becomes a loss-making operation for the processor who provided the suppliers' inputs, and this firm may have to close down its input program.

Competition increases the likelihood of sideselling in two different ways. First of all, because the threat of cut-off from future credit arrangements is less stringent when there are other credit providers available (Hoff and Stiglitz, 1998); secondly because reputation effects are less prevalent in a competitive market where buyers are less likely to coordinated and share information. This will make it easier for the supplier to find an alternative buyer. Local information-sharing networks work less well when the number of agents expands, as it costs more effort, money and/or time to let information spread among a larger group of agents (Hoff and Stiglitz, 1998). As the penalty from contract breach becomes lighter, the incidence of sideselling will be higher. As a result, processing firms will cease their input provision programs.

The discontinuation of interlinking arrangements will have a negative efficiency effect, causing the utility possibility frontier to fall back from U_2 to U_0, where we end up in point G. This phenomenon is also described in the labour economics literature: Hall and Soskice (2001) show that with more

interfirm competition, firms will invest less in their employees' human capital, taking into account the risk that other firms might freeride, enticing the employees to work at their company after being trained.

EMPIRICAL EVIDENCE

The literature provides case studies and evidence that support each of the arguments made above. Empirical evidence reveals that contract terms improve with more competition, but also that input and credit programs have collapsed because of (too much) competition and opportunistic behaviour by farmers. First, some studies show that more competition leads to a necessity for support programmes, and a concomitant willingness to provide them. Second, they show that competition increases the suppliers' bargaining position, inducing a shift in producer prices or forcing buyers to provide more extensive farm support. Third, empirical evidence confirms that many input programs have collapsed due to competition.

Competition improves contract terms for farmers

First, there is considerable evidence that increased competition following price and trade liberalization increased prices for farmers in Asia and Africa. For example, in Tanzania, the parastatal monopoly of the Cotton Board was eliminated in 1994 (Baffes, 2004). As a result of the increasing competition in cotton marketing and ginning, suppliers received an average share of 51% of export prices compared with 41% before liberalization. In Zimbabwe, cotton producer prices improved as well when new companies entered the market: before liberalization, the average producer price was 42% of the world market price (Larsen, 2002). After liberalization, it reached 53% on average. However, there is a huge year-to-year variability in producer prices. Liberalization boosted producer incentives in Zambia as well (Boughton et al. 2003). National cotton production peered from 20,000 tons to an average of 80,000 tons. Over the period 1995-2000, Zambia paid the highest average producer price share of Sub-Saharan Africa, amounting to 56% of the export price. Also in Pakistan, price liberalization, privatized export trade and the elimination of export restrictions and taxes have all contributed to higher prices and greater production incentives for cotton growers under interlinked arrangements (Smith *et al*., 1999). Opportunities for rent extraction are minimized as farmers can shift easily between lenders, according to the price and quality of the services offered.

Second, several studies report that competition leads to a higher bargaining power of the suppliers who may threat to deliver to other buyers if no input or credit is extended to them. This is found to be the case in Africa, Latin-America, Asia, and in several transition countries (Fisman and Raturi, 2004; Conning, 2000; World Bank, 2005). In Zimbabwe, although price competition among cotton ginners is weak, ginners compete on the services they offer to farmers, more specifically with respect to input and credit provision (Larsen, 2002). In Eastern Europe, competition among dairy and sugar processors contributed to the spreading of farm assistance programs (Gow *et al*., 2000; World Bank, 2005). In the Pakistani cotton market, more competition amongst buyers has lead to a tighter supply market, and credit was the only way to ensure availability of supply (Smith *et al.* 1999). Also in Pakistan, Stockbridge *et al.* (1998) indicate that many sugar mills are working below capacity. In order to attract supplies, some mills are improving the terms and conditions they offer to farmers, including more attractive prices and easier access to credit. The converse has been observed with respect to cotton ginneries in the Mirpurkhas district of Pakistan. There, because of the good cotton crops achieved in recent years, ginneries have been operating at full capacity. As a consequence, many have ceased to provide credit to their suppliers, as competing for scarce cotton supplies is no longer necessary.

It is also interesting to note that in the Zambian cotton sector, where after liberalization a high degree of concentration remained, smallholders receive credit packages of about US$43 each in the framework of interlinked contracts. Conversely, Mozambican (monopolistic) concession holding cotton companies use credit packages of only US$10-15 per hectare. Nevertheless, input prices are much higher in the latter country. At this low credit and input level, yields have remained low in Mozambique. This illustrates again that more competitive (although still relatively concentrated)

markets like Zambia already offer better contract terms to farmers than purely monopolistic markets like Mozambique.

More evidence on how competition can improve contract terms for farmers, is revealed by a comparative study of the cotton sector in 4 Central Asian countries by Swinnen *et al.* (2006).

In Uzbekistan, Tajikistan, Kyrgyzstan, and Kazakhstan, vertical coordination, including contracting and interlinking, is widespread in the cotton supply chains. Interlinking arrangements are used to overcome important constraints faced by farms, in particular access to credit, cotton seeds, and irrigation. However, the nature of the contracts and their effects on equity and efficiency differ dramatically among the countries. The reason is the different policies of the governments concerning privatization and, in particular, competition. In Kyrgyzstan and Kazakhstan, where the government has allowed the private gins to develop and to compete, farms have benefited from the reforms and from vertical coordination, with strong competition, resulting in high prices and strong cotton growth (see Table 1). On the other hand, in Uzbekistan and Tajikistan, governments actively control (directly or indirectly) input supplies, production, processing and marketing in the cotton chain. Due to the absence of competition, vertical coordination is characterized by depressed prices and stagnating cotton production, and major rent extraction of cotton farms.

Cotton exports are a major source of government revenue in Uzbekistan and the state has continued to impose strict controls on the cotton chain, including through government-controlled interlinking. Market reform has been slow. Nearly all gins remain under government ownership, and even the privately owned gins are subject to government control. Cotton farm financing is in practice only available through a single form of contracting offered by the state through the two main state banks. Inputs are provided through a centralized system of state controlled enterprises. The government re-instituted a state monopoly on the purchase of cotton in 1995, with prices fixed at low levels, based on estimated production costs[102].

Also in Tajikistan, the government continues to be heavily involved in the cotton chain. Cotton gins are jointly owned by the government and so-called “investors” which are financial institutions with (informal) links to the government. Gins operate as monopolists in clearly delineated areas, and prevent farms from delivering to other gins. The “investors” provide crop finance and sales contracts to the farms, and control also the processing of the cotton. This monopolized system leads to rent extraction from farmers with low seed cotton prices and inflated input. No alternatives are available to cotton producers.

The situation is entirely different in Kazakhstan, where interlinked contracting is also widespread in cotton production, but where both producers and processors have been freed from government control since a few years. Gins were fully privatized by 1998 and, since then, many new gins have been established. The resulting competition and reduced transport costs have benefited (small) farms. Gins provide crop finance, as well as inputs, irrigation (water) and some agricultural services (Figure 4). Large penalties have prevented opportunistic behaviour by farmers, as the perceived loss clearly exceeds the potential gains from side-selling. In case of default, a farmer has to repay his outstanding debts, incurs a penalty of 15% of the value of seed cotton not delivered under the contract and an increase in the cost of finance from 18% to 35%[103].

The situation in Kyrgyzstan is more complex. Privatization, removal of government control, and competition seem to have induced a rapid expansion of the Kyrgyz cotton sector, albeit from a very small base, with similar effects as in Kazakhstan for farms. Cotton production and processing continue to expand strongly, partly based on smuggled Uzbek cotton, induced by the large price gap for seed cotton between Uzbekistan and Kyrgyzstan. Many new gins have been constructed in recent years. Locally produced cotton is based on pre-finance contracts by the gins. However, a poor supporting

[102] For the past two years, however, important reforms have been taking place. Input provisions are being privatized, and fever restrictions are being imposed on finance.

[103] However, reforms are being carried through at present. The new Cotton Law dictates that cotton gins no longer invest in farms. This will certainly have important percussions on interlinked systems in the near future.

infrastructure and contract breaches with international traders a few years ago have negatively affected the growth of the cotton chain and contracting. Fund provision by international traders to ginneries has largely ceased. As a result, ginners have to provide financing out of their own cash reserves and this hampers their ability to finance large amounts of seed cotton.

In summary, two important effects of competition can be distinguished from this study of the Central Asian cotton sector. First, competition induced the spread of assistance programs throughout the sector. If one processor introduces an assistance program, other processors are forced to introduce similar supplier assistance programs. Suppliers may not want to deliver unless they get similar conditions. This finding confirms our general conclusion that competition is a key factor for encouraging innovation and productivity and that technological development is primarily encouraged through the presence of competition[104].

Second, competition prevents farmers from being "exploited" and allows farmers to get better conditions by improving their outside option. The only places where we find clear evidence that farmers are consistently exploited are in government-controlled monopolized systems, such as the cotton system in Uzbekistan, Tajikistan (and Turkmenistan). In contrast, in Kazakhstan and Kyrgyzstan, the cotton chain is characterized by strong competition among private gins buying cotton seeds from small farms for processing, with much better conditions for farmers. Table 1 illustrates that prices for Kazakh cotton farmers are *two to three times* higher than those in Uzbekistan or Tajikistan, where competition does not exist.

While there remain important problems in the Kazakh and Kyrgyz cotton systems, compared with the situation in Uzbekistan and Tajikistan, their situation seems to be considerably more favourable in terms of both equity and efficiency. Hence, competition plays a very important role in the cotton supply chains by inducing both beneficial equity and efficiency effects.

Competition undermines input and credit program enforcement

However, there is also considerable evidence that competition undermines the sustainability of input and credit programs. For example, in Chile, credit provision programs from traders in traditional small farmer crops like wheat, maize and beans have been given up, because of the numerous alternative marketing channels for these crops and the concomitant frequency of opportunistic sales by suppliers (Conning, 2000).

In Kenya's horticultural sector, companies without a dominant market share are subject to vigorous side-selling (Ruotsi, 2003). Frigoken, a French bean exporter, loses around 20% of its production to its competitors. Honey Care Africa, a fair trade honey exporter and Kenya Nut Ltd, a cashew and macadamia nut processor, closed down their credit provision programs because of the losses due to "pirate sales".

In the Zambian paprika sector, Cheetah Zambia reports that approximately 30-40% of total production ends up at its competitors (Ruotsi, 2003). Omnia Ltd, a leading fertilizer producer and manufacturer in Zambia, closed down its credit scheme as well due to serious credit losses. The main reason for non-repayment appeared that smallholders did not expect the company to take serious action against defaulters.

Moreover, while the liberalization process in Asia and Africa improved prices for farms, it also undermined some of the traditional input supply systems. For example, in the Tanzanian cotton sector, inputs became more expensive and less available as they were no longer provided by the Cotton Board. In fact, both input and credit provision collapsed. In fact, some authors argue that the main reason why input and credit supply chain programs are still functioning in some countries is because of the limited competition, due to state intervention. The evidence on this is mostly limited to the cotton sector (see also Poulton *et al.,* 2004).

[104] These are key conclusions in the World Bank 2005 World Development Report on "Improving the Investment Climate for Growth and Poverty Reduction".

In the Zimbabwean cotton sector, input credit provision remains viable, thanks to limited competition. There are only three major players: Cottco, the former parastatal, who continues to assume price leadership, Cargill, the US multinational, and Cotpro, in which Cottco has a 60% stake, and the remaining 40% is French. Cottco's loan recovery rate amounts up to 98%. Cottco and Cotpro are providing input credit. Suppliers deliver the contracted amounts to Cottco and Cotpro; the production surplus is sold to Cargill at more attractive rates. Up to now, input provision has remained viable, but competition is intensifying in the sector: Cottco's market share decreased from 79% (2000) to 58% (2004). At the same time, the producer share of the export price increased to 78% over the same period (Hanyani-Mlambo *et al.*, 2005)

A high degree of concentration remained after liberalization in the Zambian cotton sector as well: two dominant cotton ginneries, Dunavant and Clark Cotton, hold together a market share of 80-90% in the cotton sector. Dunavant's recovery rate for its input credit programs was around 85% in 2001.

Mozambican cotton companies work under government-allocated land concessions, forging local monopoly conditions (Boughton *et al.*, 2003; Ruotsi, 2003). Cotton companies in Mozambique are obliged to provide input credit to all producers. Foreign owned firms purchasing tobacco and maize from small farmers also benefit from such concessions. Companies without monopolistic concessions do not provide input credit, as this is perceived as unsustainable. The other side of the picture is that Mozambican producer price shares for cotton are the lowest in the region: under 40% of the export price.

MAKING INTERLINKING SUSTAINABLE UNDER COMPETITION

Our analysis shows that farms benefit from price competition between buyers. More competition leads to more equal rent sharing. But if competition gets too vigorous in the interlinked input and credit market, coordination may break down, and farmers may undermine their own productivity through strategic defaulting.

Fortunately, there is evidence that institutional arrangements can prevent, or at least mitigate the sustainability problems of input programs in a competitive environment. This way, perverse effects of buyer competition are circumvented, such that competition can lead to higher efficiency and more equitable rent sharing.

A first and obvious strategy to avoid side-selling, is to offer reliable and attractive contract terms. In Zimbabwe, incentive premiums are awarded to loyal farmers by Cottco and Cotpro, while defaulting farmers are effectively penalized (Larsen, 2002).

A second strategy is to build an informal, personal relationship between buyer and supplier: frequent monitoring and field contact appears to contribute substantially to the reduction of pirate sales as well. Intensive monitoring is an important element of the high-value interlinked vegetable chains in Madagascar (Minten *et al*., 2006)

Buyers can coordinate in order to avoid strategic default by suppliers. Conning (2000) cites an example from the fruit export sector in Chile, where lenders in fairly competitive environments create informal cartel-like arrangements to exchange information about their borrowers and to avoid side-selling. In Uganda, ginners and exporters have formed an association (UGEA) with compulsory membership of all cotton ginners (Gordon, 2000). Credit is provided by a parastatal, the Cotton Development Organization. Ginners are responsible for credit repayment, based on levies charged to the suppliers. Suppliers are free to sell their cotton to any ginner, as they are all paying the same prices and charging the same levies. Meanwhile, farmers' share in world prices rose from below 50% to 70% in the period 1995/96 to 2003/04. A similar strategy is applied in Benin, where the CSPR (Centrale de Sécurisation des Paiements et des Recouvrements) was established in 2000 to insure recovery of input credit and producer payment without delay (Goreux and Macrae, 2003). Since many ginneries are operating below capacity, the CSPR allocates quota to each ginnery in terms how the maximum amount of seed cotton they are allowed to buy. The system appears to work, but meanwhile, it remains heavily regulated.

However, such coordination may also lead to collusion, with undesirable effects. For example, in Ghana, following liberalization, private cotton companies colluded with respect to prices, such that suppliers were offered relatively low producer prices, but there was no coordination in the interlinked credit market (Poulton, 1998). Incidental side-selling resulted in low credit recovery. To make things worse, the Ministry of Agriculture was then urged to implement a local monopoly system, where each company was allowed the exclusive right of purchasing cotton in a certain zone. Similar developments occurred in Tajikistan (see above). These actions contribute to rent extraction, instead of alleviating it.

Another way of avoiding side-selling to competing buyers is to reinforce reputation effects. By making information on opportunistic behaviour publicly available, reputation losses can be severe, and violation of agreements is strongly discouraged. This mechanism is not restricted to developing countries; Bernstein (2001) describes the US cotton industry, where buyers' associations are deliberately making reputation-related information available. Members who do not comply with the rules of the association, may be suspended or expelled, and will have their names publicized. The profitability of their future business will be seriously affected this way. In Pakistan, some farmers clearly have a stronger bargaining position at harvest time than at the time the interlinked contract is originally negotiated – but a farmer that depends on the same lender for credit the following season would not exploit this advantage (Stockbridge *et al*., 1998). The threat of withdrawing future access to credit and especially publicly labelling the offending party as "a defaulter" is the lender's main instrument in the enforcement of loan repayments.

In Kenya, side-selling of part of the harvest to competitors at more attractive prices was avoided by conditioning future credit limits on past sales records (Jayne *et al.* 2004). This system also discourages suppliers to divert received fertilizer and chemicals to other crops.

A final example is to use alternative, informal mechanisms of contract enforcement. For example, in Zimbabwe, as noted above, input provision by Cottco and Cotpro remains viable, in spite of side-selling to Cargill (Larsen, 2002). Apart from other techniques formerly mentioned, microfinance group lending techniques are applied, similar to the Grameen banking principle as described by Stiglitz (1990). Interlinked contracts are assigned to groups of 5-30 suppliers. If one of them defaults, the whole group is penalized. In this way, local information is used in the process of self-selection of supplier groups. Other strategies based on peer monitoring were adapted by Pakistani agricultural traders (Smith *et al.*, 1999). New suppliers of cotton need to put forward a "guarantor" in order to be eligible for input credit provision. In Tanzania (Poulton, 1998), "Local Information Networks" were addressed to intermediate in supplier selection for input provision programs. This way, a supplier's reputation is used as "social collateral" to obtain a loan: an elegant way to overcome capital constraints. Information sharing may allow suppliers to benefit from competition between traders, whilst still having access to credit, as the risk of default by suppliers is reduced. According to Stockbridge *et al.* (1998), the effectiveness of such informal information exchange is partly a function of culture, but also depends on the available local transport and telecommunication infrastructure. An example may be the concentration of businesses of the same trade in one street or location, facilitating information exchange between traders.

CONCLUDING COMMENTS

Vertical coordination in agrifood supply chains plays an important role in overcoming market imperfections in transition and developing countries. Processing, marketing and input supplying companies have engaged in different types of contracts with farms. Processors engaged in input provision in order to secure their supply, while input supplying firms engaged in output marketing, in order to increase their sales volume and ensure repayment of provided credit. This system of "interlinking markets" has the potential to bring farm investment and production closer to their optimal levels.

This paper analyzes the equity and efficiency effects of interlinking in supply chains, and the impact of competition upon those. By introducing an interlinked contract, farms can access credit, inputs etc. which were unavailable before, and processing companies have access to higher quality and timely

supplies. Total welfare increases. It is not sure, however, that both parties gain from this transaction. That depends, amongst other factors, on the availability of supply, the degree of competition between firms, and both parties' relative bargaining strength.

Empirical evidence reveals that competition has positive equity effects, but may have either positive or negative efficiency effects. In general, farmers benefit from competition between processing firms. More competition leads to more equal rent sharing, reflected in higher producer prices. More competition can also lead to competition on the services processing firms provide to farmers. As a result, farm assistance programs may become widespread, resulting in positive efficiency effects. But if competition becomes too vigorous in the interlinked input and credit market, coordination may break down. Farmers may undermine their own long run productivity through strategic defaulting in the short run. Many case studies report of input programs that collapsed due to competition, proving empirical support of negative efficiency effects of competition. In other cases, input programs remained sustainable under competition as a result of special institutional arrangements like frequent monitoring, buyer coordination, or local information networks.

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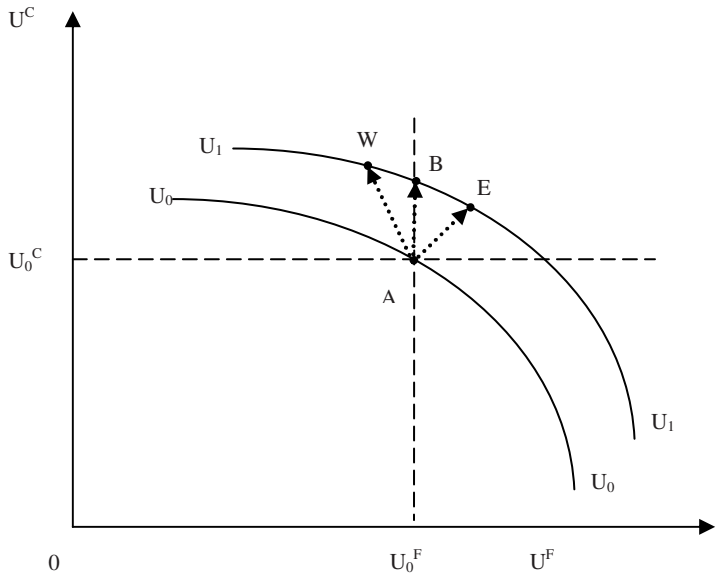
Table 1: Variations in Central Asian Cotton Production, 1992 – 2003[105]

Measure	Kazakhstan	Kyrgyzstan	Uzbekistan	Tajikistan
Annual Growth Rate Harvested Area (Ha)				
1993 – 1998	12.3	6.0	-1.7	3.7
1993 - 2003	5.8	7.6	-1.7	-0.1
Seed Cotton Production (1000 MTs)				
1993 – 1998	26.7	11	-2.3	8.4
1993 - 2003	8.9	11.5	-2.8	0.1
Baled Cotton Production (1000 MTs)				
1993 – 1998	12.6	20.4	-2.7	0.4
1993 - 2003	5.4	25.9	-2.6	-3.5
Seed Cotton Price per MT, 2003	$550.00	$450.00	$200.00	$165.00

Source: Swinnen et al., 2006

Figure 1: Possible effects of interlinking on efficiency and equity



[105] There are significant differences in seed cotton production and baled cotton production. The most important reason for these differences is probably smuggling of seed cotton from Uzbekistan and Tajikistan to Kazakhstan and Kyrgyzstan, although there is no hard data to quantify the amounts of smuggled seed cotton.

Figure 2: Bargaining power and the utility distribution

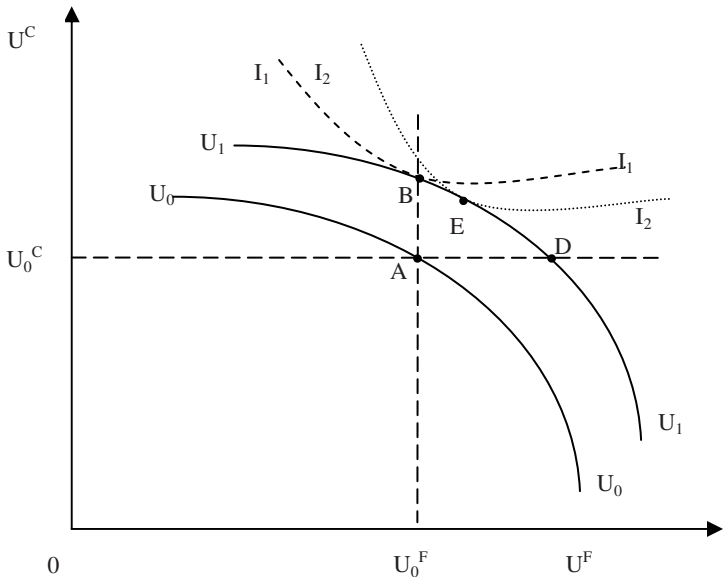


Figure 3: Effects of competition on interlinking markets

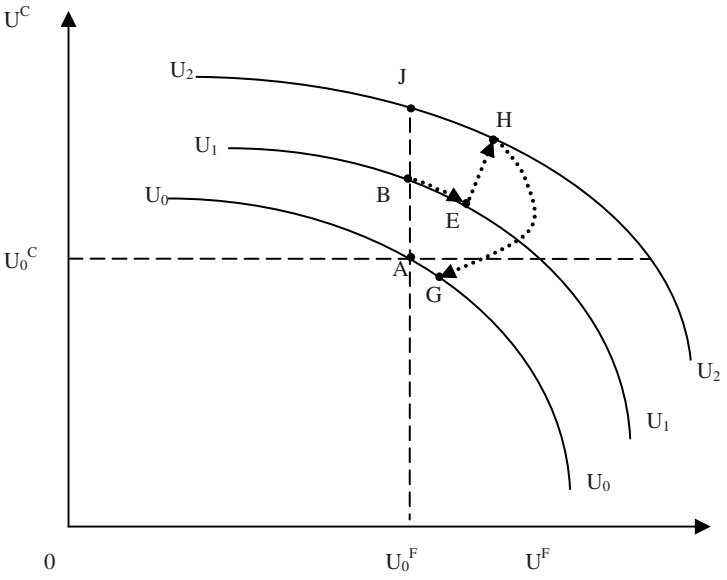
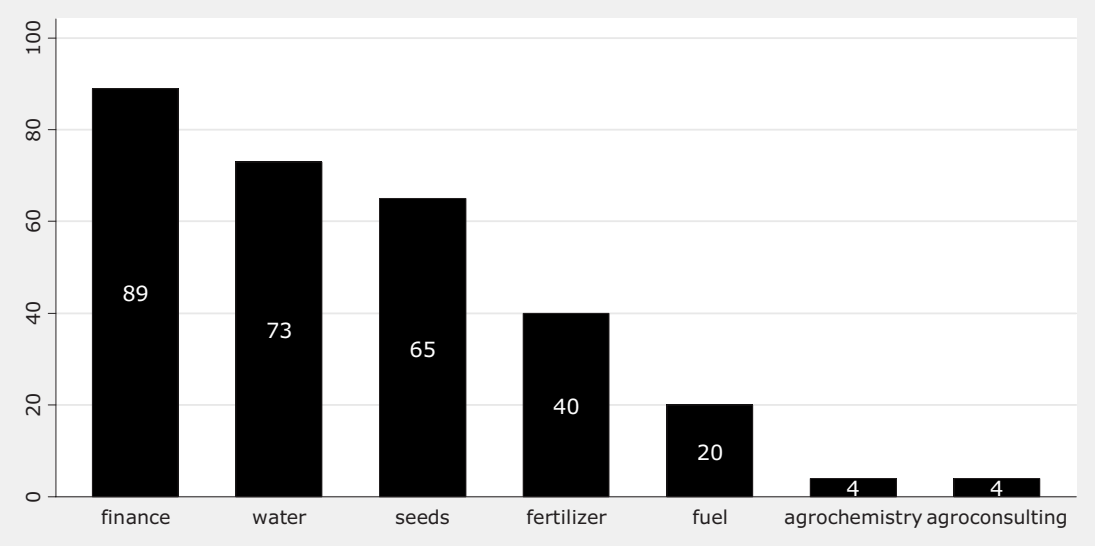


Figure 4: Share of farmers receiving specific farm assistance from cotton gins in Kazakhstan, 2003 (in %)



Source: WB Survey